Stoichiometry

Steps:

1. Write a balanced chemical reaction.
2. Determine given + needed
3. Determine the molar ratio — created from the coefficients of a balanced equation.

   coefficients → $\frac{\#\text{ mol need}}{\#\text{ mol given}}$

4. Determine the type of problem.
5. Set up conversions + complete math

Types

mole → mole (1 conv. = molar ratio)

mass → mole (2 conv. = molar mass$_A$, molar ratio)

mole → mass (2 conv. = molar ratio, molar mass$_B$)

*mass → mass (3 conv = molar mass$_{given}$, molar ratio, molar mass$_{need}$)

Vol → mol

mol → vol

*vol → vol * exchange 22.4L where is volume is used

*mass → vol

* vol → mass

master equation

$$\text{Amt. given} \times \frac{1\text{ mol given}}{\text{molar mass -or- 22.4L given}} \times \underbrace{\frac{\#\text{ mol needed}}{\#\text{ mol given}}}_{\text{molar ratio}} \times \frac{\text{molar mass -or- 22.4L needed}}{1\text{ mol needed}} = \text{theoretical yield}$$

When volume is used replace molar mass with 22.4L.

Vol → vol

$$\text{amt given} : \frac{1\text{ mol given}}{22.4\text{L given}} \times \frac{\#\text{ mol needed}}{\#\text{ mol given}} \times \frac{22.4\text{L needed}}{1\text{ mol needed}} =$$

mol → vol (2 conv.)

vol → mol (2 conv.)

mass → vol

$$\text{amt given} \times \frac{1\text{ mol given}}{\text{molar mass given}} \times \frac{\#\text{ mol needed}}{\#\text{ mol given}} \times \frac{22.4\text{L needed}}{1\text{ mol needed}} =$$

vol → mass

$$\text{amt given} \times \frac{1\text{ mol given}}{22.4\text{L given}} \times \frac{\#\text{ mol needed}}{\#\text{ mol given}} \times \frac{\text{molar mass needed}}{1\text{ mol needed}} =$$

$$\%\text{ yield} = \frac{\text{lab or actual value}}{\text{theoretical value}} \times 100$$

Compares the value obtained in lab to the mathematical value (theo.).

Limiting Factor

Compares the quantity of product created when the starting values of both reactants are known. Can be used to find "left over" or unused reactants.